MODEL K60
TELEVISION TITLING UNITS

INSTRUCTION MANUAL

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Models K60, KS60 and KX60

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CONTENTS

ILLUSTRATIONS

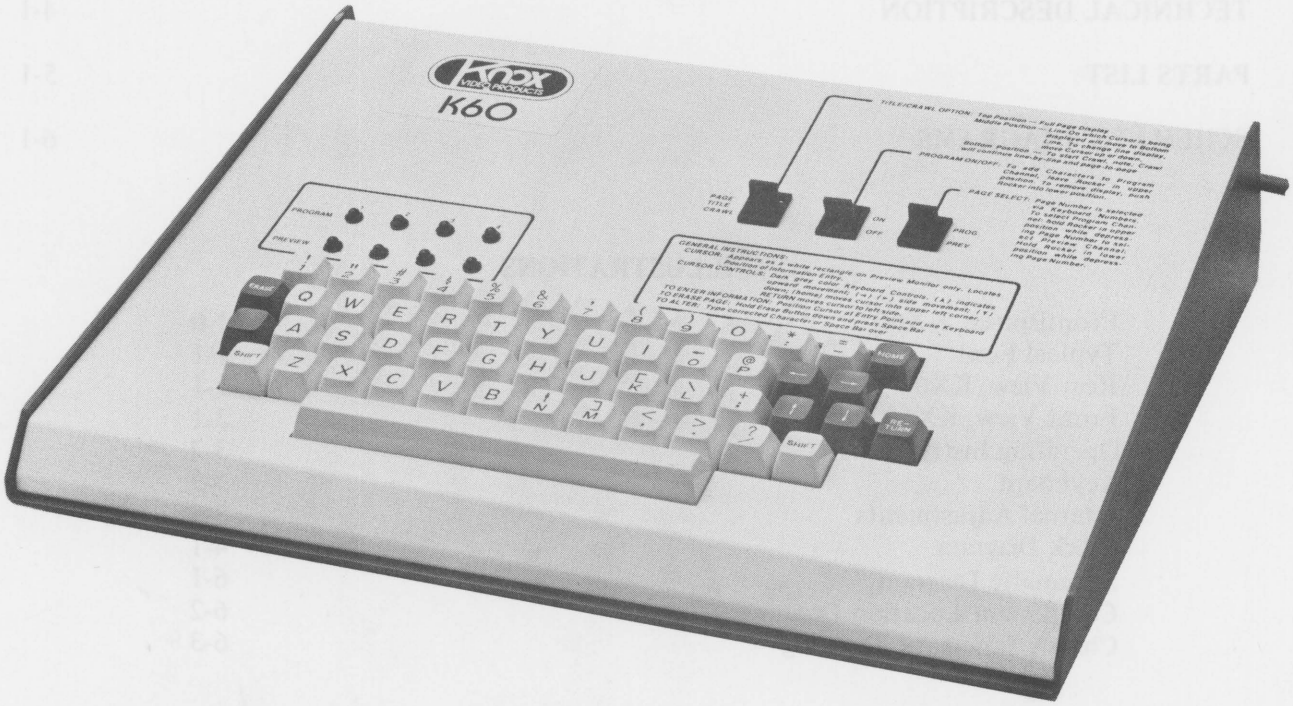


Figure 1-1. Model KX60 Television Titling Unit

SECTION 1 — General Description

1.1 GENERAL

The K60 Series Television Titling Unit provides a means of adding electronically-generated alpha-numeric titles to picture video in standard television systems. Information is entered directly onto the screen from the typewriter-like keyboard of the K60.

By using the K60, alphanumerics can be generated for display in three ways: 1) by passing a video signal through it, 2) by driving with sync as a source of video for display of alphanumerics alone, and 3) by mixing with picture in external equipment (such as mixers, special effects generators, etc.)

The K60 character alphabet contains 64 letters, numerals and symbols, any of which may be placed at any of up to 512 discrete positions on the television screen. Memory for four such pages is provided internally. A page of characters is formatted into sixteen lines of 32 characters. Control functions allow entry of information at any location on the page.

An independent video channel allows composition and editing on any one of the four pages provided while the contents of that or another page are being displayed with picture.

In addition the the basic K60 model, the KS60 provides internal sync generation (switch selectable) and the KX60 provides internal sync, timed page advance, and a title/crawl mode of operation. With the title/crawl mode the K60 allows insertion of as many as 32 independent subtitles, or one long continuously moving message in the lower third of the picture area.

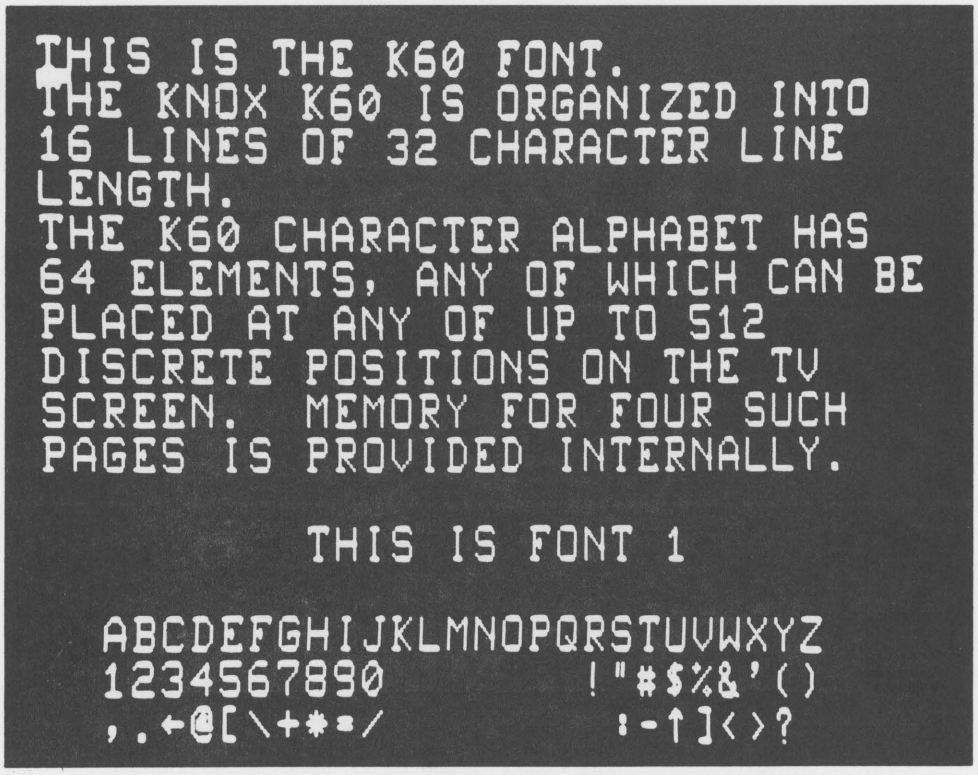


Figure 1-2. Typical Font

TABLE 1-1. SPECIFICATIONS

VIDEO INPUT	Requires full-, non-, or random-interlace composite video-sync per EIA RS-170 or RS-330, at 1.0 volts peak, terminated in 75 ohms. Looping output provided.	
VIDEO OUTPUT	**Preview** – 1.0 volt composite video-sync into 75 ohm load; 0.3V sync, 0.7V character video. **Program** – (if composite video provided) 1.0 volt (max.) composite video-sync into 75 ohm load, consisting of input video added at up to full white level, and character edge subtracted down to full black level.	
DISPLAY FORMAT		
Character Alphabet	Upper case English	26
	Numerals	10
	Typewriter Symbols	27
	Space	1
	Total	64
Character Resolution	7 x 9 dot matrix.	
Nominal Character Height	18 scan lines	
Page Format	32 characters/line; 16 lines/page.	
Internal Memory	4 full pages, switch selectable.	
CONTROL FUNCTIONS		
Keyboard: 53 keys	Character entry	43
	Shift	2
	Erase	1
	Cursor Position	6
	Pause/Flash	1
Panel Switches		
Characters Insert/Off	Controls character video on program channel in INSERT position.	
Page Select	Allows page selection via keyboard numerals in SELECT position.	
Page-Title-Crawl (KX60)	Selects full page mode, one line lower third insert, or horizontal crawl mode.	
Sync Int-Ext. (KX60)	Selects source of sync as internal or external.	
Page Advance (KX60)	Enables timed page advance feature (time adjustment internal).	
POWER REQUIREMENTS	105-125 VAC, 50/60 Hz, 50 watts (210-250 VAC, 50/60 Hz, if specified).	
SIZE	15-1/4w x 12-1/2d x 3-1/2h.	
WEIGHT	8 pounds.	

SECTION 2 — Installation

2.1 AC POWER

The K60 should be connected into standard 3-wire grounded electrical systems (normally 120 V 60 Hz but available in 220 V 50 Hz). DO NOT USE 3-wire to 2-wire adaptors. Loss of system ground could cause an electrical shock hazard, and could do extensive damage to the K60.

2.2 VIDEO INPUTS

These are the inputs to which program page titles will be added. Connect composite video-sync, 1.0 volts p-p (EIA RS170, RS330, EIA-J, or similar 525-line, 60 fields/sec standards*), to one of the input video BNC connectors at the rear of the unit. A second input BNC is available for looping the original signal to other equipment. If no looping is required, the second BNC input should be terminated with a 75-ohm resistive load.

The K60 may also be driven from composite sync-only (nominally 4.0 volts, p-p). When the K60 is driven with 4 volt sync, the Program channel will not have a usable output. To regain use of Program channel, drive the K60 through a 10:1 pad while properly terminating the sync signal externally. When using the optional internal sync (see section 2.4) the sync is padded internally.

2.3 VIDEO OUTPUTS

PREVIEW – A composite signal made up of sync regenerated from the input drive signal and video dots representing the information on the Preview page selected. This output would normally be connected to a local video monitor through 75 ohm cable for composition and editing.

PROGRAM – A composite signal made up of the video input plus video dots representing the information on the Program page selected. This is the Line output, and is meant to drive monitors, video tape recorders, modulators, or video distribution systems through 75 ohm cable. Character level is adjusted to approximately 1.0 volts. For purposes of mixing with input picture, the input signal is assumed to be composed of approximately 0.3 V sync and 0.7 volts maximum video. When the K60 is driven with sync directly, no Program output is available (see Video Inputs).

* 625 line, 50 field systems if specified

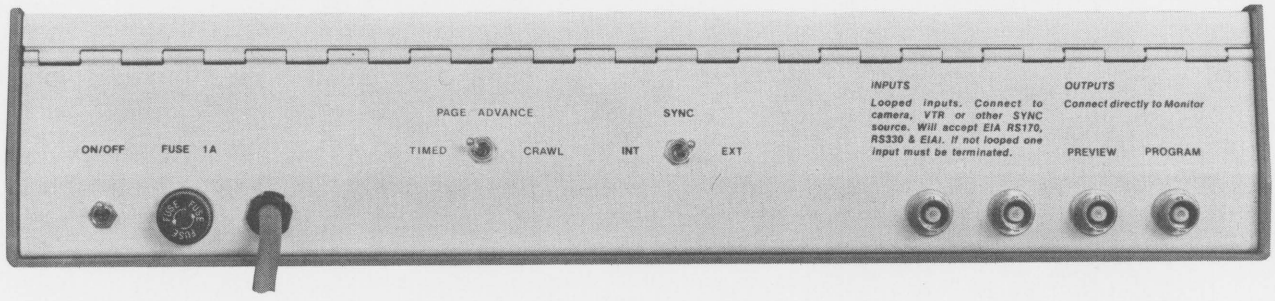


Figure 2-1. Model KX60, Rear View

2.4 INTERNAL SYNC OPTION (KS60 or KX60)

If fitted with the Internal Sync Option, the K60 has a toggle switch on the rear panel near the BNC connectors marked INT-EXT. In the EXT position the K60 requires video or sync drive. In the INT position a circuit inside the K60 generates composite sync similar to RS170 standards. Both Preview and Program outputs appear as white characters over a black background.

SECTION 3 — Operation

3.1 INITIAL START-UP

a. Connect the K60 to a 3-wire grounded AC power line with the characteristics described on the serial number plate on the back of the case.

b. Connect a suitable input video (or sync) source to one of the Video Input BNC connectors on the rear of the unit. Affix a 75 ohm termination at the looping output provided or loop out to other terminated equipment.

c. Connect a video monitor to the preview output; terminate the monitor with a 75 ohm terminator. Connect a monitor or other 75 ohm video input equipment to the Program output.

d. Move the Select switch to its center position, the Program ON/OFF switch to its full up position, and the Title/Crawl switch (on KX60 units only) also to the full up position.

e. Apply power using the toggle switch on the rear of the K60.

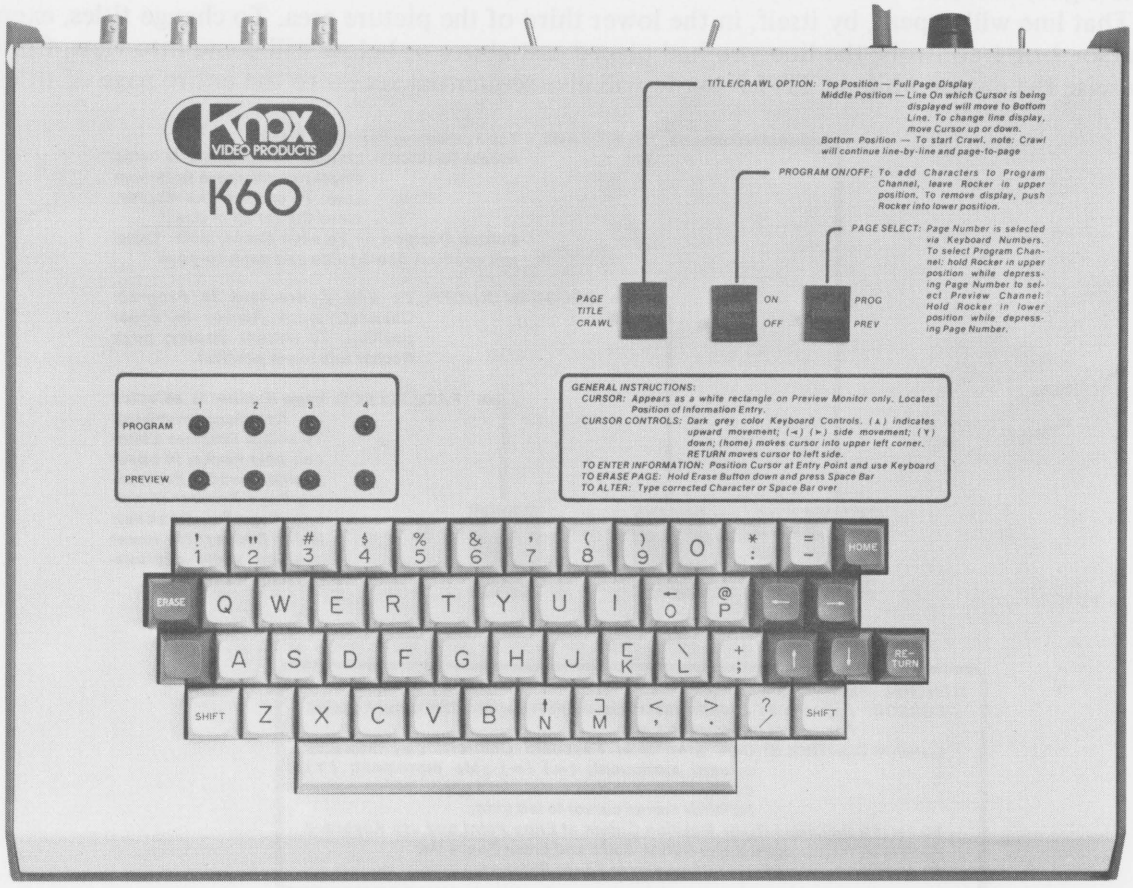


Figure 3-1. Model KX60, Front View

3.2 SELECTING PAGES

To select a PREVIEW page, move the PAGE SELECT switch to its full down position and depress a number key on the keyboard from 1 to 4. A corresponding LED indicator lamp will light. Before proceeding, make sure the SELECT switch is in its center position.

To select a PROGRAM page, move the PAGE SELECT switch to its full up position and depress one of the number keys from 1 to 4 – the page selected will be indicated by one of the four Program LED's.

PREVIEW and PROGRAM may be operated on the same page for on-line composition or editing.

3.3 VIDEO INSERT

It may sometimes be desirable to have the PROGRAM (Line) picture video passed through the K60 without adding titles. With the PROGRAM switch OFF, video will pass directly through the unit. When titles are desired, move the INSERT switch to ON.

3.4 TITLE MODE (KX60 Models Only)

With the TITLE/CRAWL switch in the full up position, the KX60 will be in full page mode. However, when using the KX60 for one-line lower third inserts, each page can make up to 8 inserts by using the TITLE mode. Compose the inserts required in advance, then place the cursor on the line (one to eight) that you wish to super. Move the TITLE/CRAWL switch to the center – TITLE – position. That line will appear, by itself, in the lower third of the picture area. To change titles, exercise the cursor ↑ or ↓ controls; the line you had placed just above or below will come into view. Continuing to exercise the cursor while in TITLE mode will give sequential access to the entire page of titles.

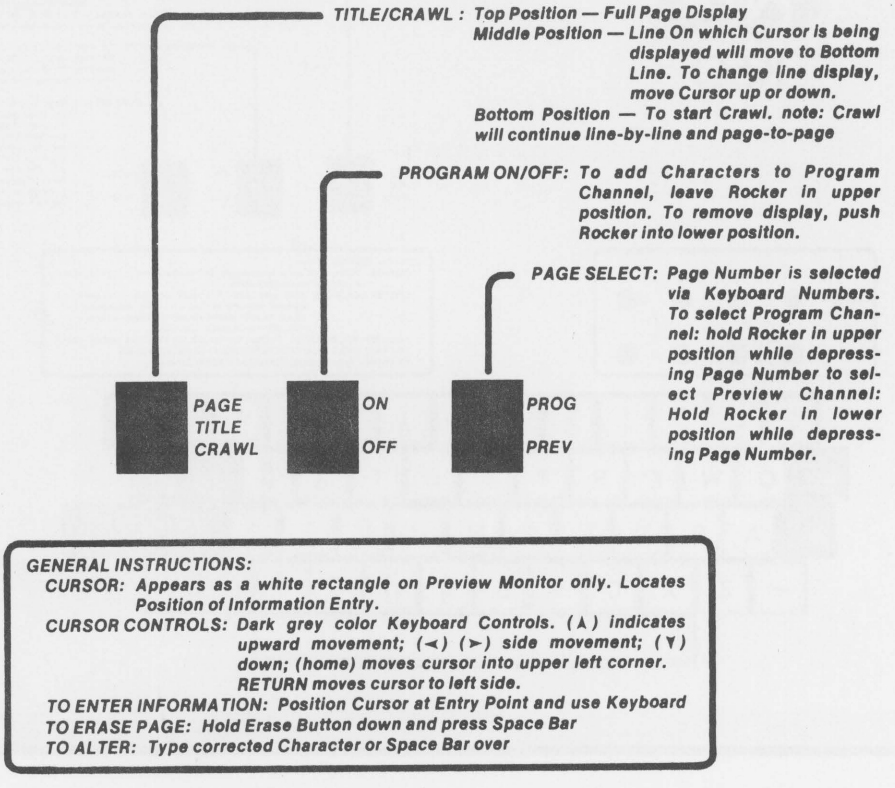


Figure 3-2. Operating Instructions on Front Panel of KX60

3.5 CRAWL MODE (KX60 Models Only)

A long message may be crawled horizontally across the lower third of the frame using Crawl mode.

First compose the message you wish to display. Because crawl messages appear as a continuous line, pay no attention to the ends of lines during composition – do not hyphenate. Be sure to load all 4 pages in sequence since crawl will automatically move from page to page.*

To start crawl, select the page and line you wish to start with by placing the cursor at that location. Move the TITLE/CRAWL switch to its center (TITLE) position to ready a crawl, then move the switch to full down when you wish to start the crawl motion. Crawl may be stopped momentarily by depressing the PAUSE (FLASH) key on the keyboard.

Crawl is sometimes more effective when starting with a blank screen. If desirable, start your crawl on a line filled with space characters. To avoid long blank spaces when displaying a repeated message, type the same message several times in the four pages of display.

To stop crawl, move the switch back to the center (TITLE) or full up (PAGE) position.

3.6 KEYBOARD CONTROLS

The Keyboard contains display control keys, cursor control keys, and character entry keys.

*Jumpers permit crawling one page only.

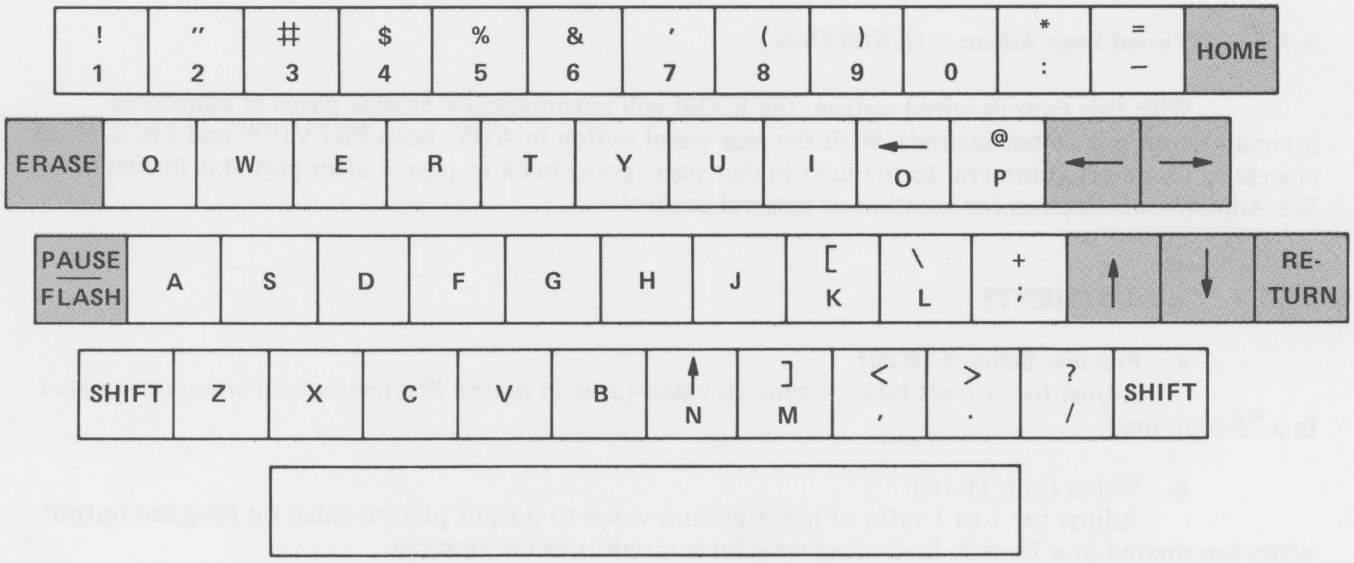


Figure 3-3. Keyboard of K60 Showing Keycap Legends

3.6.1 Display Control

ERASE is a two-key function. To erase an entire page, hold ERASE down and depress the space bar. To erase a single character, place the cursor under it and depress the space bar. The ERASE key may also be used to fill the entire picture area with any keyboard character by depressing the ERASE key and then a character key.

3.6.2 Cursor Control

In composing a page, it is important to be able to move the cursor freely without erasing characters. Six keys on the right side of the keyboard are available to position the cursor. HOME sends the cursor to the upper left corner of the frame. RETURN sends the cursor to the extreme left of whatever line it is on. The directional arrows send the cursor one space at a time in the direction indicated.

3.6.3 Character Entry

Forty-three keys are available for entry of information on the screen. To type a character, depress the appropriate key – the character will appear in the position just above the cursor and the cursor will advance one space. At the end of a line the cursor will move to the next line down. To change a character, place the cursor under it and type the correct character. The space bar behaves exactly as any other character key. The numeral keys and certain alphabet keys have a second legend on the keycap. These characters are available by depressing one of the SHIFT keys while typing.

3.6.4 Flash Key

Any character or series of characters may be made to flash on and off at the rate of 3-3/4 times per second. To enter a flash code hold the FLASH key down when typing the character. If a character has already been typed, position the cursor under it, hold the FLASH key down and re-type the letter.

3.7 Timed Page Advance (KX60 Only)

With this factory-wired option, the KX60 will automatically change pages at adjustable intervals, from one to ten seconds. With the rear panel switch in ADV, both PREVIEW and PROGRAM change at the selected interval to the next higher page, going back to page 1 after page 4 is displayed. See Adjustments Section for location of interval control.

3.8 ADJUSTMENTS

a. Preview Balance (R20)
Adjust for correct ratio of sync to video (3 to 7) on the Preview output when terminated in a 75 ohm load.

b. Video Gain (R16)
Adjust for 1 to 1 ratio of input picture video to output picture video on Program output when terminated in a 75 ohm load using waveform monitor or oscilloscope.

c. Character Level (R14)
Adjust for 1.0 volt Program character output when mixed with a properly adjusted video picture input.

d. Character Shadow (R15)
Adjust shadow level to black level on Program output when terminated in a 75 ohm load using waveform monitor or oscilloscope.

e. Character Width (R29)
Adjust for width of display which fits within your safe title area of picture.

f. Horizontal Margin (R4)
Adjust to center display line within your title area.

g. Timed Page Advance (R3) (KX60 Only)
Adjust to desired page advance time (approximately 1 to 10 seconds).

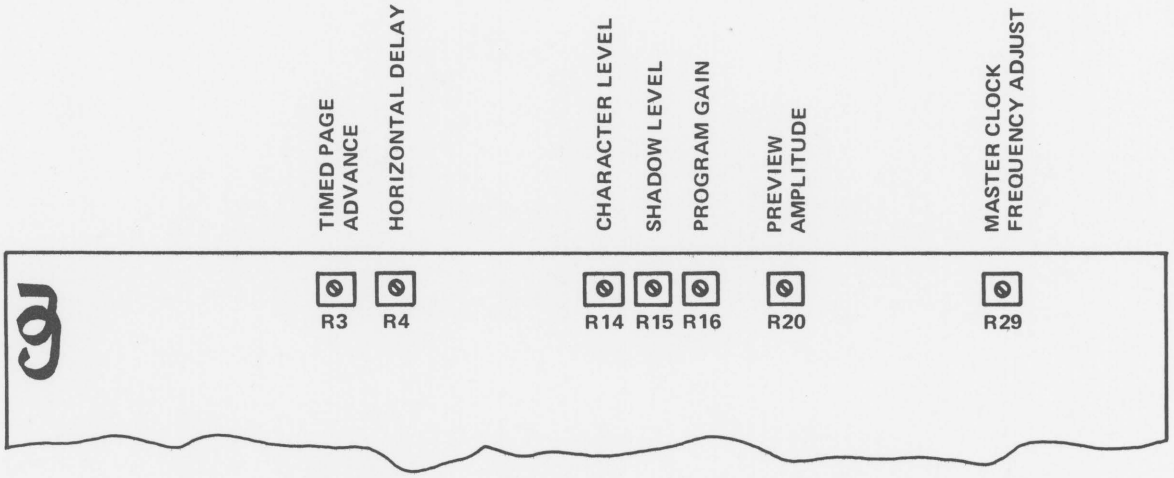


Figure 3-4. Internal Adjustments

SECTION 4 — Technical Description

4.1 GENERAL

The K60 circuitry is made up of four basic sections: Video, Character Generation, Memory and Timing. The Crawl/Title option (Model KX60) adds a fifth basic section, the crawl/title timing circuitry, to the unit.

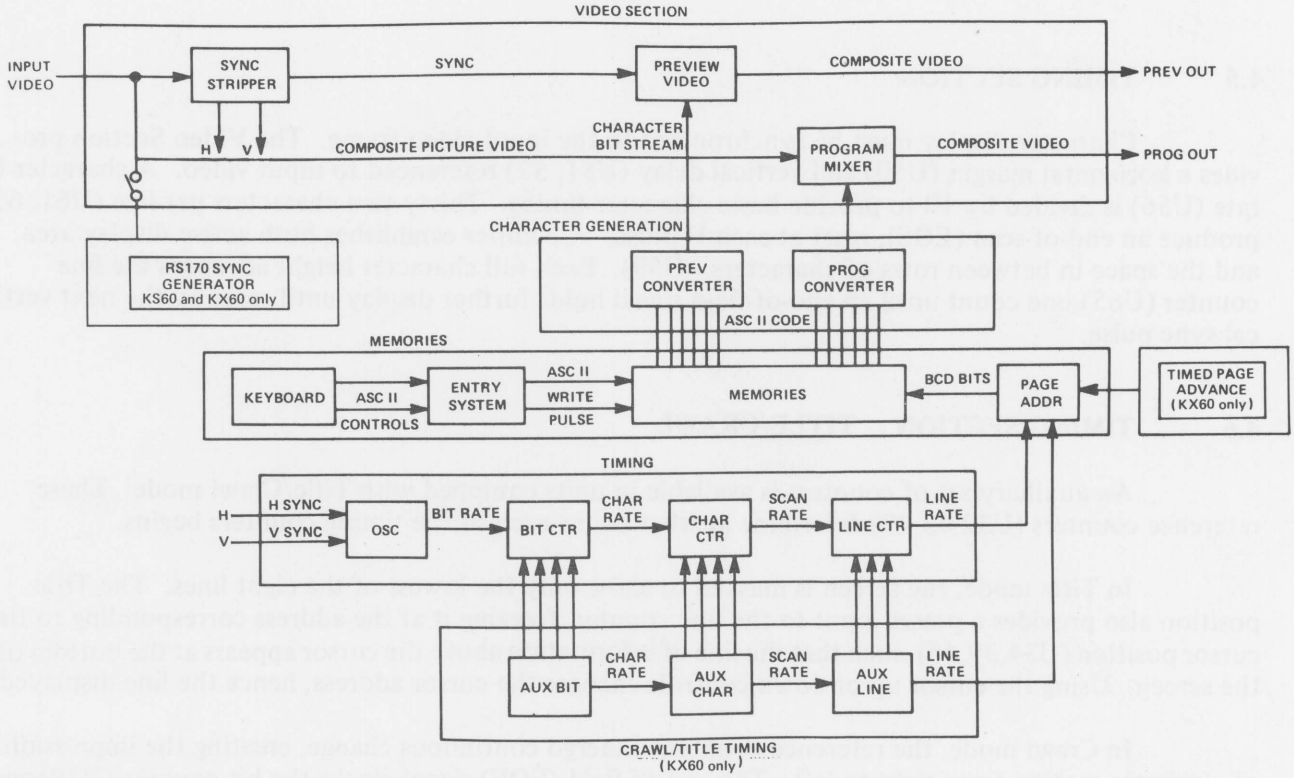


Figure 4-1. Model K60 Block Diagram

4.2 VIDEO SECTION

Video processing in the K60 involves a sync stripper (U53), vertical integrator (Q11), a circuit to synthesize preview video (Q9) and means to add titles to input video. In adding titles to existing video, first a wider version of each character is subtracted from the video signal, making a black cutout (Q6, 7). Then the characters are added back as white letters with a black background (Q4, 5).

4.3 CHARACTER GENERATION

A character bit stream (CBS) is generated for each scan line of each character on the screen. The ASCII code for each character is presented in turn to the Read-Only-Memories (U1 – Preview, U2 – Program). Scan lines are counted on the chip (U51, 52); clock and load signals (U15, 23) determine the timing and rate of the CBS to be delivered to the Video Section.

4.4 MEMORIES

Four memory IC's (U9-11) of 128 characters each are multiplexed to provide four full pages of display. Page selections are made in the page registers (U19,22) and multiplexed to the memories for (first) PROGRAM and (second) PREVIEW readout.

Information is entered into the PREVIEW page by a write pulse generated in the Entry circuitry (U18, 20, 41, 45, 47), based on the position of the cursor (U34, 35, 39, 40, 46, 47). Erase (or full field of characters) is accomplished by writing an entire page at once (U20).

In models equipped with TITLE/CRAWL, a digital adder is employed to provide smooth transition from one page to the next during CRAWL (U17).

4.5 TIMING SECTION

Character display must be synchronized to the input video frame. The Video Section provides a horizontal margin (U50) and vertical delay (U51, 52) referenced to input video. A character bit rate (U56) is divided by 10 to provide basic character timing. Thirty-two characters per line (U61, 62) produce an end-of-scan (EOS), reset at each H pulse. A counter establishes both active display area and the space in between rows of characters. (U59). Each full character height advances the line counter (U65) one count until an end-of-field signal holds further display until reset by the next vertical sync pulse.

4.6 TIMING SECTION – TITLE/CRAWL

An auxiliary set of counters is available in units equipped with Title/Crawl mode. These reference counters (U32,43,49) determine at what count each of the timing counters begins.

In Title mode, the screen is masked to show only the lowest of the eight lines. The Title position also provides a preset input to the line counter, freezing it at the address corresponding to the cursor position (U34,39,46), such that the line of information above the cursor appears at the bottom of the screen. Using the cursor up or down controls changes the cursor address, hence the line displayed.

In Crawl mode, the reference counters undergo continuous change, creating the impression of character motion from right to left. The end-of-field (EOF) signal clocks the bit counter (U49) once per field causing the display to begin earlier on each scan line. When 10 dots have been counted, the character counter (U44) shifts by one character allowing the process to begin again. After 16 characters have been counted, the first character of the next line becomes first to be displayed.

In most units, the completion of eight lines advances the page register by one page (the one-page crawl option bypasses this step, allowing a single page to repeat).

The PAUSE/FLASH keyswitch temporarily freezes the reference bit counter, halting Crawl motion.

SECTION 5 — Parts List

Reference Designation	Description	Manufacturer	Part Number
C1	Capacitor, Electrolytic, 220 μF, 10V	Sprague	196D227X9010TE4
C2	Capacitor, Electrolytic, 10 μF, 25V	Sprague	503D106G025AS
C3	Selected		
C4, C5	Capacitor, 0.1 μF, 50V	Aerovox	3420-050E-104M
C6	Capacitor, Electrolytic, 220 μF, 10V	Sprague	196D227X9010TE4
C7	Capacitor, 0.1 μF, 50V	Aerovox	3420-050E-104M
C8	Capacitor, Electrolytic, 220 μF, 10V	Sprague	196D227X 9010TE4
C9	Capacitor, 1.0 μF, 50V	Erie	8131-050-651-105M
C10	Capacitor, 0.1 μF, 50V	Aerovox	3420-050E-104M
C11	Capacitor, 1.0 μF, 50V	Erie	8131-050-651-105M
C12, C13	Capacitor, 0.1 μF, 50V	Aerovox	3420-050E-104M
C14	Not Used		
C15	Capacitor, Electrolytic, 470 μF, 16V	Sprague	503D477G016DK
C16	Capacitor, 15 pF	Centralab	DD150
C17	Capacitor, NPO, 100 pF	Erie	8121-100-C0G0-101K
C18	Capacitor, 1.0 μF, 50V	Erie	8131-050-651-105M
C19	Capacitor, 1000 μF, 50V	Sprague	TVA1316
C20	Capacitor, Electrolytic, 10 μF, 25V	Sprague	503D106G025AS
C21	Not Used		
C22	Capacitor, 0.01 μF, 100V	Erie	8121-100-X7R0-103K
C23	Capacitor, 0.002 μF	Erie	8121-100-X7R0-222K
C24	Capacitor, 0.001 μF	Erie	8121-100-X7R0-102K
CR1, CR2	Diode	National Semiconductor	1N914
CR3, CR4	Not Used		
CR5	Diode Rectifier	Varo	VH148
D1 thru D8	LED	Dialco	559-102-001
F1	Fuse, 1 Ampere, 250V	Buss	AGC-1
J1	Connector, 24-pin	Methode	1100-1-124-01
J2, J3	Connector, 6-pin header	Methode	1100-1-106-01
J4	Connector, 3-pin	Methode	3100-1-103-01
P1	Connector, Plug, Female, 24-Pin	Methode	1300-024
P2, P3	Connector, Plug, Female, 6-Pin	Methode	1300-006
P4	Connector, Plug, Female, 3-Pin	Methode	3400-003
Q1	Transistor	National Semiconductor	2N5139
Q2, Q3	Transistor	National Semiconductor	2N5134
Q4, Q5	Transistor	National Semiconductor	2N5139
Q6 thru Q9	Transistor	National Semiconductor	2N5134

Reference Designation	Description	Manufacturer	Part Number
Q10	Transistor	National Semiconductor	2N5139
Q11	Transistor	National Semiconductor	2N5134
R1, R2	Resistor, 10K, 1/4W, 5%		
R3	Resistor, Potentiometer, 500K	Beckman	72P-R504
R4	Resistor, Potentiometer, 5K	Beckman	72P-R502
R5	Resistor, 1K, 1/4W, 5%		
R6	Resistor, 47K, 1/4W, 5%		
R7, R8	Resistor, 10K, 1/4W, 5%		
R9	Resistor, 100K, 1/4W, 5%		RC07
R10	Not Used		
R11, R12, R13	Resistor, 10K, 1/4W, 5%		
R14, R15, R16	Resistor, Potentiometer, 10K	Beckman	72P-R103
R17	Resistor, 75Ω, 1/4W, 5%		RC07
R18	Resistor, 150Ω, 1/4W, 5%		RC07
R19	Resistor, 2.2K, 1/4W, 5%		RC07
R20	Resistor, Potentiometer, 10K	Beckman	72P-R103
R21	Resistor, 75Ω, 1/4W, 5%		RC07
R22	Resistor, 150Ω, 1/4W, 5%		RC07
R23, R24	Not Used		
R25	Resistor, 1.0K, 1/4W, 5%		
R26	Resistor, 1M, 1/4W, 5%		
R27	Resistor, 10K, 1/4W, 5%		
R28	Resistor, 1K, 1/4W, 5%	RC07	RC07
R29	Resistor, Potentiometer, 1K	Beckman	72P-R102
R30	Resistor, 100K, 1/4W, 5%		RC07
R31, R32	Resistor, 10K, 1/4W, 5%		
R33	Resistor, 1M, 1/4W, 5%		
R34	Resistor, 510Ω, 1/4W, 5%		
R35, R36	Not Used		
R37	Resistor, 6.8K, 1/4W, 5%		
R38, R39	Resistor, 10K, 1/4W, 5%		
R40	Resistor, 100K, 1/4W, 5%	RC07	RC07
S1	Switch, Momentary, SPDT, Center OFF	C&K	7105J61
S2	Switch, SPDT, 2-position	C&K	7101J61
S3	Switch, SPDT, Center OFF	C&K	7103J61
S4	Switch, DPDT, 2-position	C&K	7201
S5	Switch, SPDT, 2-position	C&K	7101
S6	Switch, DPDT, 2-position	C&K	7201
T1	Transformer	Signal	241-4-16
U1	IC, Character Generator	National Semiconductor	DM8678BLK
U2	IC, 4-Bit Binary Counter	National Semiconductor	74C93
U3	IC, Dual J-K Flip-Flop	National Semiconductor	74LS76
U4	IC, Character Generator	National Semiconductor	8678
U5	IC, Hex Inverters	National Semiconductor	74LS04
U6	IC, Quad 2-Input OR Gates	National Semiconductor	74LS32
U7	Resistor Network	Beckman	784-1-R10K
U8	IC, Tri-State Buffer	National Semiconductor	80C97
U9 thru U12		INTEL	2114
U13	Resistor Network	Beckman	784-1-R10K

Reference Designation	Description	Manufacturer	Part Number
U14	IC, Dual J-K Flip-Flop	National Semiconductor	74C76
U15	IC, Quad 2-Input NOR Gate	National Semiconductor	74C02
U16	IC, Quad 2-Input AND Gates	National Semiconductor	74LS08
U17	IC, 4-Bit Binary Adders	National Semiconductor	74LS 83
U18	IC, Quad 2-Input NAND Gates	National Semiconductor	74LS00
U19	IC, 4-Bit U/D Counter	National Semiconductor	74C193
U20	IC, Triple 3-Input NAND Gates	National Semiconductor	74LS10
U21	IC, Quad 2-Input Multiplier	National Semiconductor	74LS157
U22	IC, Quad 4-Bit U/D Counter	National Semiconductor	74C193
U23	IC, Quad 2-Input NAND Gate	National Semiconductor	74LS00
U24	IC, 8-Bit Parallel–Out Shift Register	National Semiconductor	74164
U25	IC, Quad 2-Input AND Gates	National Semiconductor	74LS08
U26	IC, Quad 2-Input OR Gates	National Semiconductor	74LS32
U27	IC, Quad 2-Input NAND Schmitt Trigger	National Semiconductor	14093B
U28	No IC, Jumpers Used		
U29	IC, Dual Decoders/Demultiplexers	National Semiconductor	74LS156
U30	IC, Hex Inverter	National Semiconductor	74LS04
U31, U32	IC, Synchronous 4-Bit Counter	National Semiconductor	74LS161
U33	Resistor, 5 10K, 2 1K		
U34	IC, 4-Bit U/D Counter	National Semiconductor	74C193
U35	IC, 4-Bit Magnitude Comparator	National Semiconductor	74C85
U36	IC, Quad 2-Input NAND Gates	National Semiconductor	74C00
U37	IC, Dual J-K Flip-Flop	National Semiconductor	74LS76
U38	IC, Quad 2-Input NAND Gates	National Semiconductor	74C00
U39	IC, 4-Bit U/D Counter	National Semiconductor	74C193
U40	IC, 4-Bit Magnitude Comparator	National Semiconductor	74C85
U41	IC, Op Amp	National Semiconductor	LM318
U42	IC, Quad 2-Input NAND Gates	National Semiconductor	74C00
U43, U44	IC, 4-Bit U/D Counter	National Semiconductor	74C193
U45	IC, Quad 2-Input AND Gates	National Semiconductor	74C08
U46	IC, 4-Bit U/D Counter	National Semiconductor	74LS193
U47	IC, 4-Bit Magnitude Comparator	National Semiconductor	74C85
U48, U49	IC, Decade Counter	National Semiconductor	74176
U50	IC, Dual Monostable	National Semiconductor	74C221
U51, U52	IC, 4-Bit Binary Counter	National Semiconductor	74C161
U53	IC, Comparator	National Semiconductor	LM311
U54	IC, Quad 2-Input NAND Gates	National Semiconductor	74C00
U55	IC, TV Camera Sync Generator	National Semiconductor	MM5321
U56	IC, Dual 4-Input NAND Schmitt Trigger	National Semiconductor	7413
U57	IC, 4-Bit Binary Counter	National Semiconductor	74C161
U58	Spare		
U59, U60	IC, Dual J-K Flip-Flop	National Semiconductor	74C76
U61	IC, Dual J-K Flip-Flop	National Semiconductor	74LS76
U62	IC, Synchronous 4-Bit Counter	National Semiconductor	74161
U63	IC, Hex Inverter	National Semiconductor	74LS04
U64	IC, Quad 2-Input NAND Gates	National Semiconductor	74LS00
U65	IC, Decade Counter	National Semiconductor	4017
VR1	Negative Regulator	National Semiconductor	LM320H5
VR2	Positive Regulator	National Semiconductor	LM340T5
Y1	Crystal, 2.045, 45 MHz, ±.001%, F700	Int. Crystal	432343

Reference Designation	Description	Manufacturer	Part Number
Miscellaneous:			
	Socket, 8-pin	TI	C850800
	Socket, 14-pin	TI	C851400
	Socket, 16-pin	TI	C851600
	Socket, 18-pin	TI	C851800
	KEYBOARD	Computer Operations, Inc.	1107
	Coaxial Connector	Amphenol	UG-657/U
	Fuseholder	Buss	HKP
	Line Cord	Belden	17239B
	Connector, Edge, 24-Contact	Cinch	251-12-30-160

REVISIONS				
LTR	DESCRIPTION	DATE	APPROVED	
A	CHG FROM Knox #01350	30 dec 78	KIT	
B	ARTWORK CHANGE TO REV B	1-25-79	L.S.	
C,D	ECN # 153	3-21-79	LS	
E	ECN # 159	4-17-79	LS	
F	ECN # 181	5-29-79	LS	
G	ECN #194, 197, 198	7-3-79	LS	

Spare IC: U58
Spare gates: U5 1-2; 3-4
U6 1-2-3
U16 4-5-6
U20 3-4-5-6
U25 1-2-3
U26 8-9-10
U27 1-2-3
U30 5-6
U38 8-9-10; 11-12-13
U50 1-2-3-4-13

Components not used: R23
R24
R7
CR3, CR4

GROUND PLANE INDICATED BY

The material contained herein contains information that is proprietary and confidential to Computer Operations, Inc., and is not to be copied or disclosed for any purpose except as specifically authorized in writing.

ARTWORK 16033-1
DRILL DWG 16033-0
ASSEMBLY 1395-0

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS DEC ANGLES
± ± ±

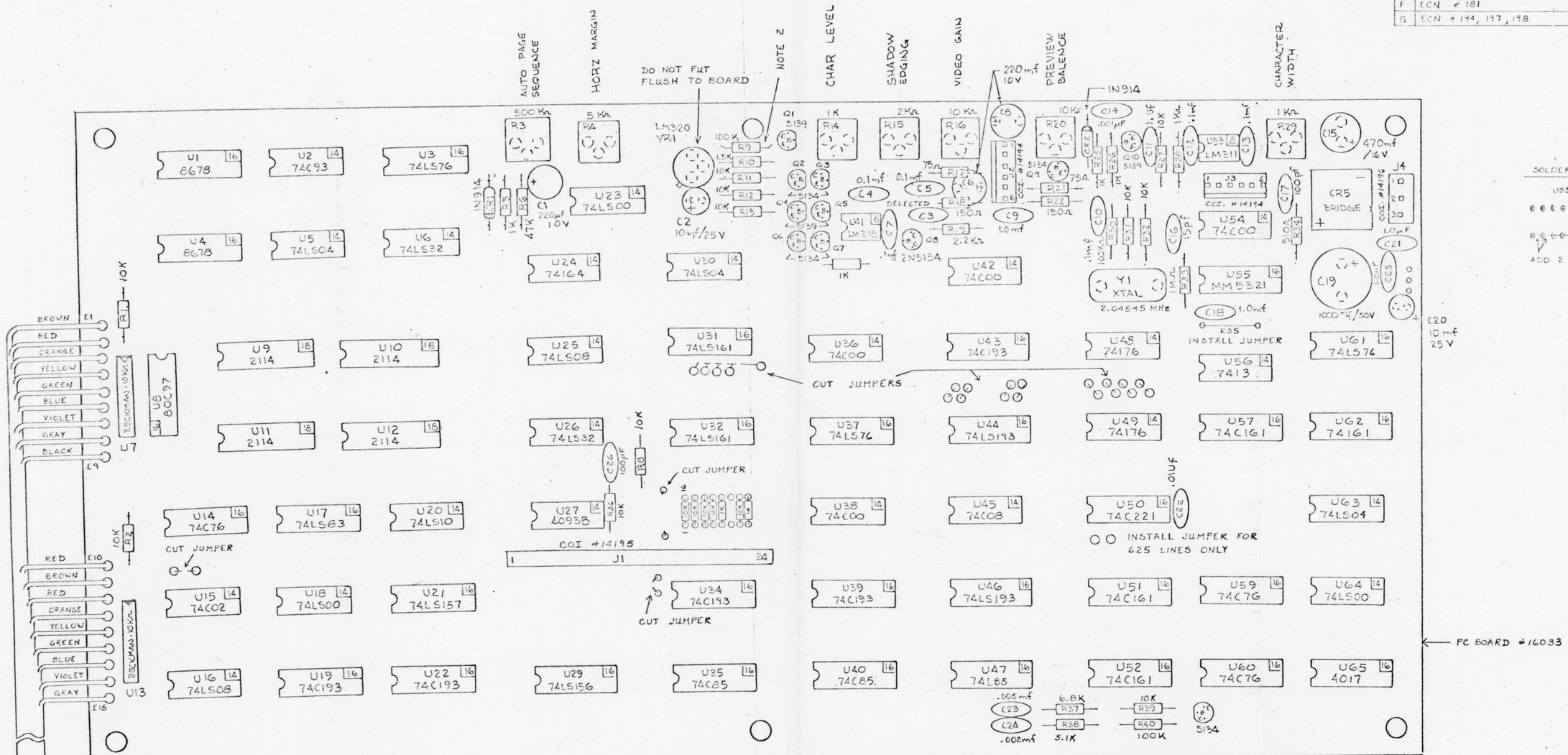
Computer Operations, Inc
9700-B GEORGE PALMER HWY. • LANHAM, MARYLAND 20801

SCHEMATIC
KX60 LOGIC

APPROVALS	DATE	SCALE	REV	SIZE	DRAWING NO.
DRAWN Kit	20 MAR 79	—	G	D	1395
CHECKED					

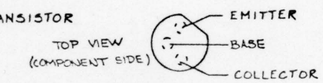
DO NOT SCALE DRAWING
SHEET

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	Rework board; chg to C01	15 dec 78	
B	ARTWORK REV TO REV B	1-17-79	
C	ECN 144	2-27-79	
D	ECN 153	3-22-79	
E	ECN # 159	4-17-79	
F	ECN # 181	5-29-79	
G	ECN # 194, 197, 198	7-3-79	



NOTES:

1. ALTERNATE TRANSISTOR ORIENTATION:



2. KEEP RESISTOR AWAY FROM MOUNTING HOLES.

ARTWORK 16033-1
DRILL DWG 16033-0
SCHEMATIC 1395-1

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±	Computer Operations, Inc. 8700-B GEORGE PALMER HWY. • LANHAM, MARYLAND 20801	
APPROVALS / DRAWN LAC JONES	DATE 8JUN78	ASSEMBLY KX60 LOGIC BOARD
CHECKED		SCALE 2/1 · REV G · SIZE D · DRAWING NO. 1395-3
		DO NOT SCALE DRAWING · SHEET 1 OF 1

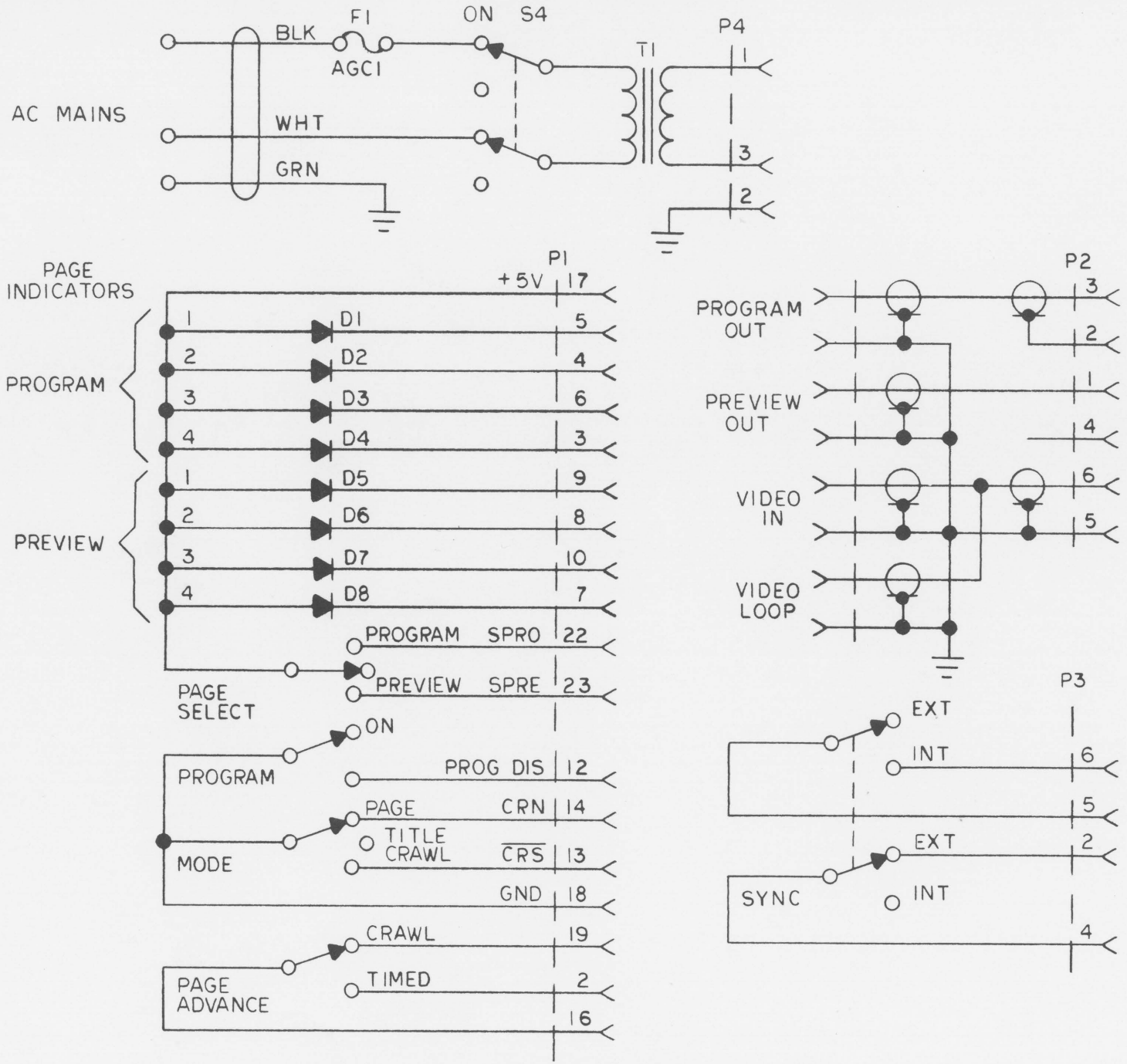


Figure 6-3. Model K60 Television Titling Unit Chassis Schematic Drawing B1251-2